

by the choice of compensation arrangements. We now address the additional question of how compensation arrangements may, over time, affect changes in the range of service provided, in the number of suppliers, and in extent of competition between suppliers.

Dynamic changes in the range of services provided and in the extent of competition are critical for long-term improvements in overall economic efficiency and the benefits consumers receive from telecommunications services. Greater competition increases efficiency and benefits consumers in at least three general ways. First, increased competition limits the ability of suppliers to exercise market power and lowers the prices consumers must pay. Where regulation has heretofore been used to constrain the exercise of market power, competition can substitute for regulation, saving the various costs imposed by regulation. Second, increased competition puts increased pressure on suppliers to find ways to reduce costs. Third, increased competition puts increased pressure on suppliers to innovate and improve the quality of the service provided. Consumers of both incumbent suppliers and of new, competing suppliers all benefit from greater competition.

Consumers also benefit from dynamic efficiency when new services are complements to existing services that increase the demand from existing suppliers, rather than substitutes that increase competition. The availability of the new complementary services provides direct benefits to consumers.

We discuss below how the choice of compensation arrangements influences market entry and the structure of retail prices and thus affects dynamic efficiency, the level of competition, and the development of new services.

A. Effects on Entry and Competition

The availability and cost of interconnection service to terminate calls to customers served by other carriers will be crucial for the competitive viability of CMRS providers and indeed for all competitive local service providers. Interconnection is valuable to LECs and to CMRS and other local service providers. The competitive significance of interconnection and its costs, however, rests on the strongly asymmetric importance of interconnection costs for LECs and for CMRS and other local providers.

The costs of obtaining interconnection services will have a much bigger impact on CMRS providers and other emerging local service providers than on LECs simply because of differences in the number of subscribers each provider is likely to have for the foreseeable future. So long as a CMRS provider or other competing local carrier has relatively few subscribers, a high proportion of the calls its subscribers place will have to be terminated “off-net” by LECs. Conversely, a high proportion of the calls placed by LEC subscribers will remain “on net” to other LEC subscribers and only a small proportion will terminate to the relatively small number of subscribers served by other providers. This phenomenon was illustrated in the hypothetical example discussed in an early section of the paper and presented in Table 1.

The difference in the proportion of calls terminated by an interconnected carrier causes a difference in the relative importance to the two carriers of the price of interconnection service. Interconnection costs will be a major component of total costs for CMRS providers and other emerging local services because such a high proportion of calls placed by their subscribers will require termination by the LEC. Conversely, interconnection costs will be a much smaller component of costs for LECs because a much smaller proportion of calls they originate will require termination by another carrier. LECs will self-supply termination service for most of the calls for which they provide origination service. In effect, LECs will be vertically integrated producers supplying end-to-end service for a high proportion of the calls their subscribers make, whereas CMRS providers and emerging competitive local carriers will have to rely on purchased inputs (termination service) for most of their product. Because the smaller carriers use much more of the purchased input per unit of output, their overall costs will be much more dependent on the price of the purchased input.⁴⁰

⁴⁰ Saying that the competitive distortion arises because of differences in the extent to which LECs and CMRS providers are vertically integrated or must purchase upstream inputs from downstream competitors may suggest regulation could solve the problem by requiring imputation. This, however, would require a vast expansion of regulatory oversight, unlikely to be either practical or effective. This solution would require LECs to impute the price charged CMRS providers for termination as a cost to local calls that LECs both originate and terminate. Imputation could not be enforced through use of separate subsidiaries since it would be impossible to divide the LEC into separate subsidiaries, one of which provides termination (both to CMRS providers and a LEC subsidiary) and another that provides origination

Consequently, the level of the price for interconnection services will have a crucial effect on competition between LECs and new service providers. A price for interconnection that is too high has only a small impact on a LEC's cost of serving a typical subscriber, and thus a small impact on the prices the LEC must charge. On the other hand, if CMRS providers, or other would-be competitors for LECs, must pay too high a price for interconnection, that will substantially increase their cost of providing service and substantially increase the prices they must charge. The result for competition will be either that the CMRS providers or other new carriers will not be viable and will not enter the market, or that they must charge higher prices. Either case results in much less competitive pressure on LEC prices.

High interconnection prices may not prevent mobile services from being viable but they may confine mobile services solely to complementing LEC wireline service, rather than also serving as substitutes. If CMRS is substantially more costly than wireline service, due in part to high interconnection costs, consumers will not substitute CMRS for LEC service in applications where either service could be used. Instead, CMRS will be used predominantly in applications that wireline service cannot provide. In these circumstances CMRS could still be viable, and indeed could still continue to grow rapidly because complementary services also are valuable. Nevertheless, interconnection prices that are too high still impose a cost in lost dynamic efficiency. First, consumers will pay too much for the complementary service, and the entry of additional suppliers of such service may be deterred. Second, because CMRS service cannot *also* serve as a substitute for LEC service, the benefits of increased competition for this type of service are lost.

Granted that high prices for interconnection service can hinder competition and harm dynamic efficiency, what does this imply for a choice between compensation arrangements? Can't inefficiently high prices for interconnection service be avoided regardless of which compensation arrangement is chosen? The answer is that, in

for local calling, purchases termination service from the other LEC subsidiary, and retails the end-to-end call. Imputation could be enforced only by direct oversight of retail pricing of local calling and local

principle, interconnection services need not be priced too high regardless of the compensation arrangement, but under bill and keep the *risk* that they will be priced incorrectly and too high is reduced.

Under bill and keep arrangements the amount each provider must pay to get interconnection services from the other does not depend on regulatory authorities having accurate information and making difficult decisions. To receive termination for the calls its subscribers place to other networks, the carrier must bear the costs of terminating calls received from the other carrier. Each provider can go about handling that traffic in the most efficient way and at the lowest possible cost. The cost of interconnection services is largely unaffected by regulatory decisions.⁴¹ Furthermore, bill and keep arrangements can be put in place quickly without the need for lengthy regulatory proceedings.

With usage sensitive pricing, the cost of interconnection services to a provider depends on the price level that is set. There is a substantial risk that this price will be too high if regulation specifies only the structure of rates, but not their level. In negotiated arrangements, as discussed earlier, a LEC will have substantially greater bargaining power than CMRS providers. In addition, the LEC can disadvantage competing suppliers with a higher price for interconnection service, even if regulation forces the LEC to pay the same high price per minute for reciprocal interconnection. Because LECs use far less of these services, raising the price will raise the costs of rivals relative to their own costs.

The character of the risk changes somewhat if interconnection prices are set or constrained by regulation. Now the effect of the price level on the development of competition depends directly on regulatory decisions. For example, if regulators rely on existing switched access charges that have been set to generate substantial contribution above cost, interconnection price levels are virtually certain to be too high.

service. That also would be a daunting regulatory task, to put it mildly.

⁴¹ The same will be true for the costs of the dedicated trunks used for interconnection if those costs are shared by having each provider responsible for the cost of the trunk to some meet point that is midway. The cost of this trunk to each provider will depend on regulatory oversight of pricing if, instead, a pricing mechanism is used to apportion costs. It should be easier, however, to set a price accurately based on cost for a single, well-defined facility dedicated to a particular use than for shared use of a network.

In order to establish new rates that are not too high, regulators will require accurate information on cost, which can be difficult and costly to collect. These undertakings create a series of problems and risks. First, regulators must rely at least in part on LECs for information on the costs of terminating traffic on the LEC network. For the reasons already given, LECs may have an incentive to claim high costs in order to justify higher prices. Second, attempts to collect cost information from CMRS providers and other local carriers are likely to impose substantial costs on those providers. Such costs themselves in effect increase the market entry costs of new carriers. Third and more generally, because regulatory decisions on interconnection pricing will be crucial to the business fortunes of these smaller carriers, they may need to participate to provide a balanced record in order to reduce the risk of regulatory decisions based only on LEC comments. Relative to total cost, the cost of participating in regulatory proceedings will be much more burdensome for small carriers than for LECs. Fourth, collecting cost information and determining new rates is likely to take time. Delays in setting interconnection rates and uncertainty about interconnection pricing increase the risk faced by new providers and will likely reduce or delay the investment in expanded capacity and new services other providers will be willing to make.

B. The Structure of Interconnection Pricing and Retail Pricing

The structure of prices CMRS providers pay for interconnection services, as well as their level, can also distort the development of competition. A previous section analyzed how the structure of usage sensitive prices will depart from the structure of capacity costs a carrier incurs to provide termination. The emphasis in that analysis was on the distortion in pricing signals. Here the focus is on how differences in the extent of distortion faced by CMRS providers and LECs will affect the development of competition.

The price a carrier pays for interconnection service becomes part of its cost structure, which in turn affects the structure of its retail prices. As we have noted, terminating traffic outside its busy hour imposes little or no cost on the terminating carrier. If, notwithstanding, the originating carrier must pay for each additional minute

terminated, that traffic will be costly for the originating carrier, and that cost will have to be considered in setting the retail price to customers. That much is true for both CMRS providers and LECs when usage sensitive rates are charged for termination.

Where the two providers differ is in how much termination service each purchases from the other, and how much each self-supplies because the call goes “on-net” to another of its subscribers. A CMRS provider or LEC sees the true cost structure of termination for the calls it both originates and terminates on its own network; retail pricing for this “on-net” calling can be based on the underlying cost structure, not the cost structure created by prices of interconnection inputs.

The LEC self-supplies termination for most calls originated on its network and would purchase termination from the CMRS provider for only a small proportion of calls. The cost structure for most LEC calling will be the underlying cost structure of carrying the traffic, not one that would be imposed by termination service purchased at a per-minute rate. The LEC’s retail price structure can reflect the fact that much calling in fact imposes little or no cost on the network. In contrast, a high proportion of calls originated by the CMRS provider, or by an emerging local competitor, will require termination service from the LEC. The cost structure for a high proportion of this provider’s calling will therefore depend on the rate structure for termination service, and its retail rates for calling and service must in turn be based on that cost structure.

It is widely appreciated that one of the benefits of competition is that it pushes price closer to cost. Usually the emphasis is on competition preventing the level of prices from exceeding the level of costs. Competition also generates important benefits, however, by creating market forces that push the structure of prices to more closely match the structure of costs. That benefit will not be realized as fully if new local suppliers that expand competition incur costs that are heavily influenced by wholesale interconnection prices that differ substantially from the underlying cost structure. Furthermore, if new carriers gain significant market shares, the cost structure of LECs also will become more dependent on the price structure for interconnection services.

To some extent, this problem is a manifestation, at the level of retail prices, of the difficulty already discussed above of setting prices that match costs and send “optimal,”

efficient price signals. We already saw that neither usage sensitive prices nor bill and keep fully matches the underlying cost structure. Nor is any other feasible price structure likely to be fully optimal in this sense. This means both that there will be deadweight losses because prices, both retail and wholesale, depart from the underlying cost structures, and that the cost structure of a carrier will be more or less affected by this disparity, depending on the extent to which it relies on termination services supplied by other carriers. If fully optimal prices are not feasible, this problem can be fully solved only by eliminating competing carriers that must acquire interconnection services from other carriers -- and that surely is throwing the baby out with the bath water. While it may be impossible to eliminate the problem, the effect on retail pricing of choosing a compensation arrangement and wholesale price structure should be kept in mind. There still can be better and worse arrangements, even if there is no fully optimal result.

Differences between the cost structure of a CMRS provider that purchases most termination and the cost structure of a LEC that self-supplies most termination, can affect the ability of the carriers to compete for customers. In some cases, the different cost structures will give each carrier advantages with some types of customers and disadvantages with others. For example, uniform pricing could tend to increase the costs for a CMRS provider of serving customers with relatively large traffic volumes terminated outside the busy hour since this is when the uniform price exceeds the cost of termination. At the same time, the uniform price would tend to lower costs for the CMRS provider to serve customers with relatively large volumes of busy-hour traffic because this is when a uniform price (equal to average cost per minute) is lower than cost. The net impact of such effects may be difficult to determine without fairly detailed information on demand and costs.⁴²

The net effect of other potential distortions may be clear. The following is offered as a possibility illustrating this general point. When a LEC sets a flat rate for retail

⁴² The impact of bill and keep on attracting customers may be more difficult to determine since it will depend on how a carrier recovers the costs imposed on it by having to provide termination service to the interconnected carrier.

service, much of the additional calling that is induced occurs outside the busy hour and would impose little additional cost since the LEC does not have to purchase termination. Carriers who must pay a uniform price per minute to terminate most calling, however, will find it more difficult to set flat rates for retail service than carriers who self-supply and see the underlying capacity costs of termination. For most of the calling of the carrier paying usage sensitive rates, every additional minute of calling terminated by another carrier increases cost.

As noted above, such a difference in retail price structures could differentially affect the ability of the carriers to compete for customers with different calling patterns. In addition, setting and collecting usage sensitive retail prices could impose increased transactions costs on the CMRS provider. If, but for the uniform price on termination, the CMRS provider would not set such usage sensitive retail prices and would not bear these additional transactions costs, choosing to impose uniform wholesale prices increases the overall costs of the CMRS provider relative to those of the LEC.⁴³ In addition, customers may have a clear preference for flat-rated pricing structures. Or, even if retail charges in any case would depend to some extent on usage, consumers might prefer tariff structures, such as purchases of blocks of time, that do not impose marginal prices for all additional usage. Carriers who must pay uniform prices for termination may find it unprofitable to offer such pricing structures, and that in turn could make the CMRS service less attractive to consumers. The retail pricing characteristics generated by the structure of wholesale prices would make it more difficult, in this case, for the competing CMRS service to attract subscribers.

VIII. Conclusions

In the future, it is likely that consumers increasingly will be able to choose among multiple networks for local telecommunications services. These networks -- both wireless and wireline, mobile and fixed, and supplied by CMRS, LECs, and CLECs --

⁴³ If the carrier would in any case use usage sensitive retail pricing that was just as costly to implement, the additional costs could not be attributed to the structure of wholesale prices.

can be expected to offer an increased range of services and to compete directly with each other. However, consumers will only fully realize the benefits of multiple local telecommunications networks if the arrangements for interconnecting these networks are efficient. The Commission in its *Notice* asks for comments on one group of interconnection arrangements -- those between CMRS providers and LECs.

Interconnection arrangements are far more critical for CMRS providers, and other smaller networks, than they are for LECs. The proportion of a CMRS subscriber's originated and received traffic that requires interconnection will be much higher than the proportion for a LEC subscriber, simply because of the relative size of the CMRS and LEC networks. As a result, the cost and quality of interconnection will have a much greater impact on the cost and quality of CMRS service per subscriber than of LEC service. The resulting difference in the bargaining positions of the two providers means that negotiations between CMRS providers and LECs that are unconstrained by regulatory rules or controls are unlikely to yield efficient compensation arrangements for interconnection.

Consequently, the choice among compensation arrangements for interconnection between CMRS providers and LECs is a matter of importance for the Commission and for consumers. This paper has analyzed economic issues that should be considered in evaluating the advantages and disadvantages of bill and keep arrangements and of usage sensitive pricing for interconnection traffic. Accurately identifying the advantages and disadvantages of each compensation arrangement requires a systematic analysis that digs below the surface. Once that is done, the advantages and disadvantages of bill and keep arrangements and of usage sensitive pricing are not necessarily what they might appear to be at first sight.

- Both bill and keep and usage sensitive prices impose costs on carriers for the interconnection services they receive. To determine whether the costs of interconnection service provided to each carrier are balanced, one must analyze both the magnitude of interconnected traffic that imposes capacity costs and the magnitude of capacity costs per minute for each carrier; simply looking at the balance of total interconnected traffic is not sufficient. Information collected from CTIA members suggests that the costs that

interconnection imposes on CMRS providers and LECs may be more balanced than the total traffic flows between the two types of providers.

- Neither usage sensitive prices nor bill and keep arrangements send fully optimal pricing signals. Furthermore, without detailed demand and cost information, it is not possible to determine that price signals will be more efficient with either a uniform price or a peak/off-peak price structure for interconnected traffic than with bill and keep arrangements.
- Usage sensitive pricing will impose higher transactions costs to measure and bill for interconnected traffic than will bill and keep arrangements.
- The risk of hindering competition and reducing dynamic efficiency is greater with usage sensitive compensation arrangements than with bill and keep arrangements, because usage sensitive compensation arrangements risk setting excessive prices for interconnection service.

In the end, on the basis of available information, there is no simple case for asserting the clear superiority of usage sensitive pricing over bill and keep arrangements. Each arrangement has both advantages and disadvantages. In these circumstances careful attention should be given to the risks that usage sensitive pricing poses for the development of new and competing carriers that promise great benefits for consumers. Excessive prices for interconnected traffic can either block the entry of some carriers and their service, or prevent consumers from fully realizing the benefits of their entry and expansion. Even temporary reliance on excessive prices, while trying to establish prices better matched to the level and structure of costs, will delay the development of CMRS service and forego consumers benefits. In contrast, the immediate adoption of bill and keep interconnection arrangements between LECs and CMRS providers, at least on an interim basis, will ensure that the development of these services is not handicapped by interconnection arrangements that impose excessive prices.